boric acid. When a drop of household ammonia is added to the colored turmeric paper, it is turned a dark green, almost black color, if boric acid is present. If the reddish color, however, was caused by the use of too much hydrochloric acid this green color does not form.

Caution.—The corrosive nature of hydrochloric acid must not be forgotten. It must not be allowed to touch the flesh, clothes, or any metal.

Detection of Colors.—The detection of coloring matter in sausage is often a difficult matter without the use of a compound microscope. It may sometimes be separated, however, by macerating the meat with a mixture of equal parts of glycerine and water to which a few drops of acetic or hydrochloric acid have been added. After macerating for some time the mixture is filtered and the coloring matter detected by means of dyeing wool in the liquid thus obtained.

Spices.—Although ground spices are very frequently adulterated, there are few methods that may be used by one who has not had chemical training, and who is not skilled in the use of a compound microscope, for the detection of the adulterants employed. The majority of the substances used for the adulteration of spices are of a starchy character. Unfortunately for our purposes, most of the common spices also contain a considerable amount of starch. Cloves, mustard, and cayenne, however, are practically free from starch, and the presence of starch in the ground article is proof of adulteration.

Detection of Starch in Cloves, Mustard, and Cayenne.—A half teaspoonful of the spice in question is stirred into half a cupful of boiling water, and the boiling continued for 2 or 3 minutes. The mixture is then cooled. If of a dark color, it is diluted with a sufficient amount of water to reduce the color to such an extent that the reaction formed by starch and iodine may be clearly apparent if starch be present. The amount of dilution can only be determined by practice, but usually the liquid must be diluted with an equal volume of water, or only ½ of a teaspoonful of the sample may be employed originally. A single drop of tincture of iodine is now added. If starch is present, a deep blue color, which in the presence of a large amount of starch appears black, is formed. If no blue color appears, the addition of the iodine tincture should be continued, drop by drop, until the liquid shows by its color the presence of iodine in solution.

Detection of Colors.—Spice substitutes are sometimes colored with coal-tar colors. These products may be detected by the methods given.

Vinegar.—A person thoroughly familiar with vinegar can tell much regarding the source of the article from its appearance, color, odor, and taste.

If a glass be rinsed out with the sample of vinegar and allowed to stand for a number of hours or overnight, the odor of the residue remaining in the glass is quite different with different kinds of vinegar. Thus, wine vinegar has the odor characteristic of wine, and cider vinegar has a peculiar fruity odor. A small amount of practice with this test enables one to distinguish with a high degree of accuracy between wine and cider vinegars and the ordinary substitutes.

If a sample of vinegar be placed in a shallow dish on a warm stove or boiling teakettle and heated to a temperature sufficient for evaporation and not sufficient to burn the residue, the odor of the warm residue is also characteristic of the different kinds of vinegar. Thus, the residue from cider vinegar has the odor of baked apples and the flavor is acid and somewhat astringent in taste, and that from wine vinegar is equally characteristic. The residue obtained by evaporating vinegar made from sugar-house products and from spirit and wood vinegar colored by means of caramel has the peculiar bitter taste characteristic of caramel.

If the residue be heated until it begins to burn, the odor of the burning product also varies with different kinds of vinegar. Thus, the residue from cider vinegar has the odor of scorched apples, while that of vinegars made from sugar-house wastes and of distilled and wood vinegars colored with a large amount of caramel has the odor of burnt sugar. In noting these characteristics, however, it must be borne in mind that, in order to make them conform to these tests, distilled and wood vinegars often receive the addition of apple jelly.

The cheaper forms of vinegar, especially distilled and wood vinegar, are commonly colored with caramel, which can be detected by the method given.

FOOD COLORANTS.

(Most, if not all, of these colorants are injurious and should therefore be used with extreme caution.)

Sausage Color.—To dye sausage red, certain tar dyestuffs are employed,

especially the azo dyes, preference being given to the so-called genuine red. For this purpose about 100 parts of dyestuff are dissolved in 1,000 to 2,000 parts of hot water; when the solution is complete, add a likewise hot solution of 45 to 50 parts of boracic acid, whereupon the mixture should be stirred well for some time; then filter, allow to cool, and preserve in tightly closing bottles. It is absolutely necessary in using aniline colors to add a disinfectant to the dyestuff solution, the object of which is, in case the sausage should commence to decompose, to prevent the decomposition azo dyestuff by the disengaged hydrogen. Instead of boracic acid, formalin may be used as a disinfectant. Of this formalin, 38 per cent, add about 25 to 30 parts to the cooled and filtered dyestuff solution. This sausage color is used by adding about 1½ to 2 tablespoonfuls of it to the preserving salt measured out for 100 kilos of sausage mass, stirring well. The sausage turns neither gray nor yellow on storing.

Cheese Color.—I.—To produce a suitable, pretty yellow color, boil 100 parts of orlean or annatto with 75 parts of potassium carbonate in 1½ to 2 liters of water, allow to cool, and filter after settling, whereupon 15 to 18 parts of boracic acid are added to give keeping qualities to the solution. According to another method, digest about 200 parts of orlean, 200 parts of potassium carbonate, and 100 parts of turmeric for 10 to 12 days in 1,500 to 2,000 parts of 60 per cent alcohol, filter, and keep in bottles. To 100,000 parts of milk to be made into cheese add 1½ to 2 small spoonfuls of this dye, which imparts to the cheese a permanent and natural yellow appearance.

II.—To obtain a handsome yellow color for cheese, such as is demanded for certain sorts, boil together 100 parts of annatto and 75 parts of potassium carbonate in from 1,500 to 2,000 parts of pure water; let it cool, stand it aside for a time, and filter, adding finally from 12 to 15 parts of boracic acid as a preservative. For coloring butter, there is in the trade a mixture of bicarbonate of soda with 12 per cent to 15 per cent of sodium chloride, to which is added from 1½ per cent to 2 per cent of powdered turmeric.

Butter Color.—For the coloring of butter there is in the market under the name of butter powder a mixture of sodium bicarbonate with 12 to 15 per cent of sodium chloride and 1½ to 2 per cent of powdered turmeric; also a mixture of sodium bicarbonate, 1,500 parts; saffron surrogate, 8 parts; and salicylic acid, 2 parts. For the preparation of liquid butter color use a uniform solution of olive oil, 1,500 parts; powdered turmeric, 300 parts; orlean, 200 parts. The orlean is applied on a plate of glass or tin in a thin layer and allowed to dry perfectly, whereupon it is ground very fine and intimately mixed with the powdered turmeric. This mixture is stirred into the oil with digestion for several hours in the water bath. When a uniform, liquid mass has resulted, it is filtered hot through a linen filter with wide meshes. After cooling, the filtrate is filled into bottles. Fifty to 60 drops of this liquid color to 1½ kilos of butter impart to the latter a handsome golden yellow shade.

INFANT FOODS:

Infants' (Malted) Food.—

I.—Powdered malt	1 ounce
Oatmeal (finest ground).....	2 ounces
Sugar of milk.....	4 ounces
Baked flour.....	1 pound

Mix thoroughly.

II.—Infantine is a German infant food which is stated to contain egg albumen, 5.5 per cent; fat, 0.08 per cent; water, 4.22 per cent; carbohydrates, 86.58 per cent (of which 54.08 per cent is soluble in water); and ash, 2.81 per cent (consisting of calcium, 10.11 per cent; potassium, 2.64 per cent; sodium, 25.27 per cent; chlorine, 36.65 per cent; sulphuric acid, 3.13 per cent; and phosphoric acid, 18.51 per cent).

MEAT PRESERVATIVES.

(Most of these are considered injurious by the United States Department of Agriculture and should therefore be used with extreme caution.)

The Preservation of Meats.—Decomposition of the meat sets in as soon as the blood ceases to pulse in the veins, and it is therefore necessary to properly preserve it until the time of its consumption.

The nature of preservation must be governed by circumstances such as the kind and quality of the article to be preserved, length of time and climatic condition, etc. While salt, vinegar, and alcohol merit recognition on the strength of a long-continued usage as preservatives, modern usage favors boric acid and borax, and solutions containing salicylic acid and sulphuric acid are common,

and have been the subject of severe criticism.

Many other methods of preservation have been tried with variable degrees of success; and of the more thoroughly tested ones the following probably include all of those deserving more than passing mention or consideration.

1. The exclusion of external, atmospheric electricity, which has been observed to materially reduce the decaying of meat, milk, butter, beer, etc.

2. The retention of occluded electric currents. Meats from various animals packed into the same packages, and surrounded by a conducting medium, such as salt and water, liberate electricity.

3. The removal of the nerve centers. Carcasses with the brains and spinal cord left therein will be found more prone to decomposition than those wherefrom these organs have been removed.

4. Desiccation. Dried beef is an excellent example of this method of preservation. Other methods coming under this heading are the application of spices with ethereal oils, various herbs, coriander seed extracted with vinegar, etc.

5. Reduction of temperature, i. e., cold storage.

6. Expulsion of air from the meat and the containers. Appert's, Willaumez's, Redwood's, and Prof. A. Vogel's methods are representative for this category of preservation. Phenyl paper, Dr. Busch's, Georges's, and Medlock and Baily's processes are equally well known.

7. The application of gases. Here may be mentioned Dr. Gamgee's and Bert and Reynoso's processes, applying carbon dioxide and other compressed gases, respectively.

Air-drying, powdering of meat, smoking, pickling, sugar or vinegar curing are too well known to receive any further attention here. Whatever process may be employed, preference should be given to that which will secure the principal objects sought for, the most satisfactory being at the same time not deleterious to health, and of an easily applicable and inexpensive nature.

To Preserve Beef, etc., in Hot Weather.—Put the meat into a hot oven and let it remain until the surface is browned all over, thus coagulating the albumen of the surface and inclosing the body of the meat in an impermeable envelope of cooked flesh. Pour some melted lard or suet into a jar of sufficient size, and roll the latter around until the sides are evenly coated to the depth of half an inch with the material. Put in the meat, taking care that it does not touch the sides of the jar (thus scraping away the envelope of grease), and fill up with more suet or lard, being careful to completely cover and envelop the meat. Thus prepared, the meat will remain absolutely fresh for a long time, even in the hottest weather. When required for use the outer portion may be left on or removed. The same fat may be used over and over again by melting and retaining in the melted state a few moments each time, by which means not only all solid portions of the meat which have been retained fall to the bottom, but all septic microbes are destroyed.

Meat Preservatives.—I.—*Barmenite Corning Agent:* For every 100 parts, by weight, take 25.2 parts, by weight, of saltpeter; 46.8 parts, by weight, sodium chloride; 25.7 parts, by weight, cane sugar; 0.8 parts, by weight, plaster of Paris or gypsum; 0.1 part, by weight, of some moistening material, and a trace of magnesia.

II.—*Carniform, A:* For every 100 parts, by weight, take 3.5 parts, by weight, sodium diphosphate; 3.1 parts, by weight, water of crystallization; 68.4 parts, by weight, sodium chloride; 24.9 parts, by weight, saltpeter; together with traces of calcium phosphate, magnesia, and sulphuric acid.

III.—*Carniform, B:* For every 100 parts, by weight, take 22.6 parts, by weight, sodium diphosphate; 17.3 parts, by weight, water of crystallization; 59.7 parts, by weight, saltpeter; 0.6 parts, by weight, calcium phosphate; with traces of sulphuric acid and magnesia.

IV.—*"Cervelatwurst" (spice powder):* For 100 parts, by weight, take 0.7 parts, by weight, of moistening; 3.5 parts, by weight, spices—mostly pepper; 89 parts, by weight, sodium chloride; 5 parts, by weight, saltpeter; 0.7 parts, by weight, gypsum; and traces of magnesia.

V.—*Cervelatwurst Salt (spice powder):* For 100 parts, by weight, take 7.5 parts, by weight, spices—mostly pepper; 1.6 parts, by weight, moistener; 81.6 parts, by weight, sodium chloride; 2.5 parts, by weight, saltpeter; 6.2 parts, by weight, cane sugar; and traces of magnesia.

VI.—*Rubrolin Sausage (spice powder):* For 100 parts by weight, take 53.5 parts, by weight, sal ammoniac, and 45.2 parts, by weight, of saltpeter.

VII.—*Servator Special Milk and Butter Preserving Salt:* 80.3 per cent of crystallized boracic acid; 10.7 per cent

sodium chloride; and 9.5 per cent of benzoic acid. (Its use is, however, prohibited in Germany.)

VIII.—*Wittenberg Pickling Salt:* For 100 parts, by weight, take 58.6 parts, by weight, sodium chloride; 40.5 parts, by weight, saltpeter; 0.5 parts, by weight, gypsum; traces of moisture and magnesia.

IX.—*Securo:* For a quart take 3.8 parts, by weight, aluminum oxide, and 8 parts, by weight, acetic acid; basic acetate of alumina, 62 parts, by weight; sulphuric acid, 0.8 parts, by weight; sodium oxide, with substantially traces of lime and magnesia.

X.—*Michels Cassala Salt:* This is partially disintegrated. 30.74 per cent sodium chloride; 15.4 per cent sodium phosphate; 23.3 per cent potassio-sodic tartrate; 16.9 per cent water of crystallization; 1.2 per cent aluminum oxide; and 2.1 per cent acetic acid as basic acetate of alumina; 8.4 per cent sugar; 0.98 per cent benzoic acid; 0.5 per cent sulphuric acid; and traces of lime.

XI.—*Corning Salt:* Sodium nitrate, 50 parts; powdered boracic acid, 45 parts; salicylic acid, 5 parts.

XII.—*Preservative Salt:* Potassium nitrate, 70 parts; sodium bicarbonate, 15 parts; sodium chloride, 15 parts.

XIII.—*Another Corning Salt:* Potassium nitrate, 50 parts; sodium chloride, 20 parts; powdered boracic acid, 20 parts; sugar, 10 parts.

XIV.—*Maciline (offered as condiment and binding agent for sausages):* A mixture of wheat flour and potato flour dyed intensely yellow with an azo dyestuff and impregnated with oil of mace.

XV.—
Borax	80 parts
Boric acid	17 parts
Sodium chloride	3 parts

Reduce the ingredients to a powder and mix thoroughly.

XVI.—
Sodium sulphite, powdered	80 parts
Sodium sulphate, powdered	20 parts

XVII.—
Sodium chloride	80 parts
Borax	8 parts
Potassium nitrate	12 parts

Reduce to a powder and mix.

XVIII.—
Sodium nitrate	50 parts
Salicylic acid	5 parts
Boric acid	45 parts

XIX.—
Potassium nitrate	70 parts
Sodium bicarbonate	15 parts
Sodium chloride	15 parts

XX.—
Potassium nitrate	50 parts
Sodium chloride	20 parts
Boric acid	20 parts
Sugar	10 parts

A German Method of Preserving Meat.—Entire unboweled cattle or large, suitably severed pieces are sprinkled with acetic acid and then packed and transported in sawdust impregnated with cooking salt and sterilized.

Extract of Meat Containing Albumen.—In the ordinary production of meat extract, the albumen is more or less lost, partly through precipitation by the acids or the acid salts of the meat extract, partly through salting out by the salts of the extract, and partly by coagulation at a higher temperature. A subsequent addition of albumen is impracticable because the albumen is likewise precipitated, insolubly, by the acids and salts contained in the extract. This precipitation can be prevented, according to a French patent, by neutralizing the extract before mixing with albumen, by the aid of sodium bicarbonate. The drying of the mixture is accomplished in a carbonic acid atmosphere. The preparation dissolves in cold or hot water into a white, milky liquid and exhibits the smell and taste of meat extract, if the albumen added was tasteless. The taste which the extract loses by the neutralization returns in its original strength after the mixture with albumen. In this manner a meat preparation is obtained which contains larger quantities of albumen and is more nutritious and palatable than other preparations.

Foot-Powders and Solutions

The following foot-powders have been recommended as dusting powders:

I.—
Boric acid	2 ounces
Zinc oleate	1 ounce
Talcum	3 ounces

II.—
Oleate of zinc (powdered)	½ ounce
Boric acid	1 ounce
French chalk	5 ounces
Starch	1½ ounces

III.—Dried alum	1	drachm
Salicylic acid	½	drachm
Wheat starch	4	drachms
Powdered talc	1½	ounces
IV.—Formaldehyde solution	1	part
Thymol	1/10	part
Zinc oxide	35	parts
Powdered starch	65	parts
V.—Salicylic acid	7	drachms
Boric acid. 2 ounces,	440	grains
Talcum	38	ounces
Slippery elm bark	1	ounce
Orris root	1	ounce
VI.—Talc	12	ounces
Boric acid	10	ounces
Zinc oleate	1	ounce
Salicylic acid	1	ounce
Oil of eucalyptus	2	drachms
VII.—Salicylic acid	7	drachms
Boric acid	3	ounces
Talcum	38	ounces
Slippery elm, powdered	1	ounce
Orris, powdered	1	ounce

Salicylated Talcum.—

I.—Salicylic acid	1	drachm
Talcum	6	ounces
Lycopodium	6	drachms
Starch	3	ounces
Zinc oxide	1	ounce
Perfume, quantity sufficient.		
II.—Tannoform	1	drachm
Talcum	2	drachms
Lycopodium	30	grains

Use as a dusting powder.

Solutions for Perspiring Feet.—

I.—Balsam Peru	15	minims
Formic acid	1	drachm
Chloral hydrate	1	drachm
Alcohol to make 3 ounces.		

Apply by means of absorbent cotton.

II.—Boric acid	15	grains
Sodium borate	6	drachms
Salicylic acid	6	drachms
Glycerine	1½	ounces
Alcohol to make 3 ounces.		

For local application.

FOOTSORES ON CATTLE:
See Veterinary Formulas.

FORMALDEHYDE:
See also Disinfectants, Foods, and Milk.

Commercial Formaldehyde.—This extremely poisonous preservative is obtained by passing the vapors of wood spirit, in the presence of air, over copper heated to redness. The essential parts of the apparatus employed are a metal chamber into which a feed-tube enters, and from which 4 parallel copper tubes or oxidizers discharge by a common exit tube. This chamber is fitted with inspection apertures, through which the course of the process may be watched and controlled. The wood spirit, stored in a reservoir, falls into a mixer where it is volatilized and intimately mixed with air from a chamber which is connected with a force pump. The gases after traversing the oxidizer are led into a condensing coil, and the crude formaldehyde is discharged into the receiver beneath.

The small amount of uncondensed gas is then led through a series of two washers. The "formol" thus obtained is a mixture of water, methyl alcohol, and 30 to 40 per cent of formaldehyde. It is rectified in a still, by which the free methyl alcohol is removed and pure formol obtained, containing 40 per cent of formaldehyde, chiefly in the form of the acetal. Rectification must not be pushed too far, otherwise the formaldehyde may become polymerized into trioxmethylene. When once oxidation starts, the heat generated is sufficient to keep the oxidizers red hot, so that the process works practically automatically.

Determination of the Presence of Formaldehyde in Solutions.—Lemme makes use, for this purpose, of the fact that formaldehyde, in neutral solutions of sodium sulphite, forms normal bisulphite salts, setting free a corresponding quantity of sodium hydrate, that may be titrated with sulphuric acid and phenolphthalein. The sodium sulphite solution has an alkaline reaction toward phenolphthalein, and must be exactly neutralized with sodium bisulphite. Then to 100 cubic centimeters of this solution of 250 grams of sodium sulphite ($Na_2SO_3+7H_2O$) in 750 grams water, add 5 cubic centimeters of the suspected formaldehyde solution. A strong red color is instantly produced. Titrate with normal sulphuric acid until the color disappears. As the exact disappearance of the color is not easily determined, a margin of from 0.1 to 0.2 cubic centimeters may be allowed without the exactness of the reaction being injured, since 1 cubic centimeter of normal acid answers to only 0.03 grams of formaldehyde.

FORMALIN FOR GRAIN SMUT:
See Grain.

FRAMES: THEIR PROTECTION FROM FLIES.

Since there is great risk of damaging the gilt when trying to remove fly-specks with spirits of wine, it has been found serviceable to cover gilding with a copal varnish. This hardens and will stand rough treatment, and may be renewed wherever removed.

FRAME CLEANING:

See Cleaning Preparations and Methods.

FRAME POLISHES:

See Polishes.

FRAMING, PASSE-PARTOUT:

See Passe-Partout.

Freezing Preventives

An excellent antifreezing solution can be prepared by dissolving ethylene glycol in water and placing in the automobile radiator. Varying concentrations of ethylene glycol may be used; the solution containing 60 parts ethylene glycol and 40 parts of water freezes at —57° F.

Liquid for Cooling Automobile Engines.—In order to prevent freezing of the jacket water, when the engine is not in operation in cold weather, solutions are used, notably of glycerine and of calcium chloride ($CaCl_2$). The proportions for the former solution are equal parts of water and glycerine, by weight; for the latter, approximately ½ gallon of water to 8 pounds of $CaCl_2$, or a saturated solution at 60° F. This solution ($CaCl_2+6H_2O$) is then mixed with equal parts of water, gallon for gallon. Many persons complain that $CaCl_2$ corrodes the metal parts, but this warning need do no more than urge the automobilist to use only the chemically pure salt, carefully avoiding the "chloride of lime" ($CaOCl_2$).

A practical manufacturing chemist of wide experience gives this:

A saturated solution of common salt is one of the best things to use. It does not affect the metal of the engine, as many other salts would, and is easily renewed. It will remain fluid down to 0° F., or a little below.

Equal parts of glycerine and water is also good, and has the advantage that it will not crystallize in the chambers, or evaporate readily. It is the most convenient solution to use on this account, and may repay the increased cost over brine, in the comfort of its use. It needs only the occasional addition of a little water to make it last all winter and leave the machinery clean when it is drawn off. With brine an incrustation of salt as the water evaporates is bound to occur which reduces the efficiency of the solution until it is removed. Water frequently must be added to keep the original volume, and to hold the salt in solution. A solution of calcium chloride is less troublesome so far as crystallizing is concerned, but is said to have a tendency to corrode the metals.

Anti-Freezing Solution for Automobilists.—Mix and filter 4½ pounds pure calcium chloride and a gallon of warm water and put the solution in the radiator or tank. Replace evaporation with clean water, and leakage with solution. Pure calcium chloride retails at about 8 cents per pound, or can be procured from any wholesale drug store at 5 cents.

Anti-Freezing, Non-Corrosive Solution.—A solution for water-jackets on gas engines that will not freeze at any temperature above 20° below zero (F.) may be made by combining 100 parts of water, by weight, with 75 parts of carbonate potash and 50 parts of glycerine. This solution is non-corrosive and will remain perfectly liquid at all temperatures above its congealing point.

Anti-Frost Solution.—As an excellent remedy against the freezing of shop windows, apply a mixture consisting of 55 parts of glycerine dissolved in 1,000 parts of 62 per cent alcohol, containing, to improve the odor, some oil of amber. As soon as the mixture clarifies, it is rubbed over the inner surface of the glass. This treatment, it is claimed, not only prevents the formation of frost, but also stops sweating.

Protection of Acetylene Apparatus from Frost.—Alcohol, glycerine, and calcium chloride have been recommended for the protection of acetylene generators from frost. The employment of calcium chloride, which must not be confounded with chloride of lime, appears preferable in all points of view. A solution of 20 parts of calcium chloride in 80 parts of water congeals only at 5° F. above zero. But as this temperature does not generally penetrate the generators, it will answer to use 10 or 15 parts of the chloride for 100 parts of water, which will almost always be sufficient to avoid congelation. Care must be taken not to use sea salt or other alkaline or metallic salts, which deteriorate the metal of the apparatus.

FROST BITE.

When the skin is as yet unbroken, Hugo Kuhl advises the following:

I.—Carbolized water	4	drachms
Nitric acid	1	drop
Oil of geranium	1	drop

Mix. Pencil over the skin and then hold the penciled place near the fire until the skin is quite dry.

If the skin is already broken, use the following ointment:

II.—Hebra's ointment	500	parts
Glycerine	100	parts
Liquefied carbolic acid	15	parts

Mix. Apply to the broken skin occasionally.

III.—Camphor	25	parts
Iodine, pure	50	parts
Olive oil	500	parts
Paraffine, solid	450	parts
Alcohol, enough.		

Dissolve the camphor in the oil and the iodine in the least possible amount of alcohol. Melt the paraffine and add the mixed solutions. When homogeneous pour into suitable molds. Wrap the pencils in paraffine paper or tin foil, and pack in wooden boxes. By using more or less olive oil the pencils may be made of any desired consistency.

IV.—Dissolve 5 parts of camphor in a mixture consisting of 5 parts of ether and 5 parts of alcohol; then add collodion sufficient to make 100 parts.

V.—Dissolve 1 part of thymol in 5 parts of a mixture of ether and alcohol, then add collodion sufficient to make 100 parts.

VI.—Carbolic acid	2	parts
Lead ointment	40	parts
Lanolin	40	parts
Olive oil	20	parts
Lavender oil	1½	parts
VII.—Tannic acid	15	parts
Lycopodium	15	parts
Lard	30	parts
VIII.—Zinc oxide	15	parts
Glycerine	45	parts
Lanolin	40	parts
IX.—Ichthyol	10	parts
Resorcin	10	parts
Tannic acid	10	parts
Distilled water	50	parts

Any of these is to be applied about twice a day.

FROSTED LENSES FOR AUTOMOBILE HEADLIGHTS: Make a strong solution of Epson Salts which paint on the inside surface of the lenses and let it dry. If this solution is desired to be removed at any time it can be washed off with hot water. A permanent frosting can be had by rubbing the inside of the lens with a very fine Emery Paper or with powdered Carborundum mixed with water.

Fruit Preserving

(See also Essences, Extracts, and Preserves.)

How to Keep Fruit.—According to experiments of Max de Nansouty, fruit carefully wrapped in silk paper and then buried in dry sand will preserve a fresh appearance with a fresh odor or flavor, almost indefinitely. It may also be preserved in dry excelsior, but not nearly so well. In stubble or straw fruit rots very quickly, while in shavings it mildews quickly. In short, wheat-straw fruit often takes on a musty taste and odor, even when perfectly dry. Finally, when placed on wooden tablets and exposed to the air, most fruit decays rapidly.

I.—Crushed Strawberry.—Put up by the following process, the fruit retains its natural color and taste, and may be exposed to the air for months, without fermenting:

Take fresh, ripe berries, stem them, and rub through a No. 8 sieve, rejecting all soft and green fruit. Add to each gallon of pulp thus obtained, 8 pounds of granulated sugar. Put on the fire and bring just to a boil, stirring constantly. Just before removing from the fire, add to each gallon 1 ounce of a saturated alcoholic solution of salicylic acid, stirring well. Remove the scum, and, while still hot, put into jars, and hermetically seal. Put the jars in cold water, and raise them to the boiling point, to prevent them from bursting by sudden expansion on pouring hot fruit into them. Fill the jars entirely full, so as to leave no air space when fruit cools and contracts.

II.—Crushed Raspberry.—Prepare in the same manner as for crushed strawberry, using ½ red raspberries and ½ black, to give a nice color, and using 7 pounds of sugar to each gallon of pulp.

III.—Crushed Pineapple.—Secure a good brand of canned grated pineapple, and drain off about one-half of the liquor, by placing on a strainer. Add to each pound of pineapple 1 pound of granulated sugar. Place on the fire, and bring to boiling point, stirring constantly. Just before removing from the fire, add to each gallon of pulp 1 ounce saturated alcoholic solution of salicylic acid.

Put into air-tight jars until wanted for use.

IV.—Crushed Peach.—Take a good brand of canned yellow peaches, drain off liquor, and rub through a No. 8 sieve. Add sugar, bring to the boiling point, and when ready to remove from fire add to each gallon 1 ounce saturated alcoholic solution of salicylic acid. Put into jars and seal hermetically.

V.—Crushed Apricot.—Prepared in similar manner to crushed peach, using canned apricots.

VI.—Crushed Orange.—Secure oranges with a thin peel, and containing plenty of juice. Remove the outer, or yellow peel, first, taking care not to include any of the bitter peel. (The outer peel may be used in making orange phosphate, or tincture of sweet orange peel.) Next remove the inner, bitter peel, quarter, and remove the seeds. Extract part of the juice, and grind the pulp through an ordinary meat grinder. Add sugar, place on the fire, and bring to the boiling point. When ready to remove, add to each gallon 1 ounce of saturated alcoholic solution of salicylic acid and 1 ounce of glycerine. Put into air-tight jars.

VII.—Crushed Cherries.—Stone the cherries and grind them to a pulp. Add sugar, and place on the fire, stirring constantly. Before removing, add to each gallon 1 ounce of the saturated solution of salicylic acid. Put into jars and seal.

VIII.—Fresh Crushed Fruits in Season.—In their various seasons berries and fruits may be prepared in fresh lots for the soda fountain each morning, by reducing the fruit to a pulp, and mixing this pulp with an equal quantity of heavy simple syrup.

Berries should be rubbed through a sieve. In selecting berries, it is better to use the medium-sized berries for the pulp, reserving the extra large specimens for garnishing and decorative effects.

Mash the berries with a wooden masher, never using iron or copper utensils, which may discolor the fruit.

Pineapple may be prepared by removing the rough outer skin and grating the pulp upon an ordinary tin kitchen grater. The grater should be scrupulously clean, and care should be taken not to grate off any of the coarse, fibrous matter comprising the fruit's core.

All crushed fruits are served as follows: Mix equal quantities of pulp and simple syrup in the counter bowl; use 1½ to 2 ounces to each glass, adding the usual quantity of cream, or ice cream. Draw soda, using a fine stream freely.

IX.—Glacés.—Crushed fruits, served in the following manner, make a delicious and refreshing drink:

Crushed fruit..... 12 drachms
Juice of half a lemon.
Shaved ice.

Put the ice into a small glass, add the fruit and lemon juice, stir well, and serve with a spoon and straws.

FRUIT PRODUCTS, TESTS FOR:
See Foods.

FRUIT SYRUPS:
See Syrups.

FRUIT VINEGAR:
See Vinegar.

Fumigants

(See also Disinfectants.)

Fumigating Candles.—I.—Lime wood charcoal, 6,000 parts, by weight, saturated with water (containing saltpeter, 150 parts, by weight, in solution), and dried again, is mixed with benzoin, 750 parts, by weight; styrax, 700 parts, by weight; mastic, 100 parts, by weight; cascarilla, 450 parts, by weight; Peruvian balsam, 40 parts, by weight; Mitcham oil, lavender oil, lemon oil, and bergamot oil, 15 parts, by weight, each; and neroli oil, 3 parts, by weight.

II.—Charcoal, 7,500 parts, by weight; saltpeter, 150 parts, by weight; Tolu balsam, 500 parts, by weight; musk, 2 parts, by weight; rose oil, 1 part. The mixtures are crushed with thick tragacanth to a solid mass.

III.—Sandal wood, 48 parts, by weight; clove, 6 parts, by weight; benzoin, 6 parts, by weight; licorice juice, 4 parts, by weight; potash saltpeter, 2 parts, by weight; cascarilla bark, 1.5 parts, by weight; cinnamon bark, 1.5 parts, by weight; musk, 0.05 parts, by weight. All these substances are powdered and mixed, whereupon the following are added: Styrax (liquid), 5 parts, by weight; cinnamon oil, 0.05 parts, by weight; clove oil, 0.05 parts, by weight; geranium oil, 0.5 parts, by weight; lavender oil, 0.2 parts, by weight; Peruvian balsam, 0.2 parts, by weight. The solid ingredients are each powdered separately, then placed in the respective proportion in a

spacious porcelain dish and intimately mixed by means of a flat spatula. The dish must be covered up with a cloth in this operation. After the mixture has been accomplished, add the essential oils and just enough solution of gum arabic so that by subsequent kneading with the pestle a moldable dough results which possesses sufficient solidity after drying. The mass is pressed into metallic molds in the shape of cones not more than ¾ of an inch in height.

IV.—Red Fumigating Candles.—Sandal wood, 1 part; gum benzoin, 1.5 parts; Tolu balsam, 0.250 parts; sandal oil, .025 parts; cassia oil, .025 parts; clove oil, 25 parts; saltpeter, .090 parts. The powder is mixed intimately, saturated with spirit of wine, in which the oils are dissolved, and shaped into cones.

V.—Wintergreen oil	1 part
Tragacanth	20 parts
Saltpeter	50 parts
Phenol, crystallized	100 parts
Charcoal, powdered	830 parts
Water.	

Dissolve the saltpeter in the water, stir the solution together with the powdered charcoal and dry. Then add the tragacanth powder, also the wintergreen oil and the phenol, and prepare from the mixture, by means of a tragacanth solution containing 2 per cent of saltpeter, a mass which can be shaped into candles.

Fumigating Perfumes.—These are used for quickly putting down bad odors in the sick room, etc. They are decidedly antiseptic, and fulfil their purpose admirably.

I.—Select good white blotting paper, and cut each large sheet lengthwise into 3 equal pieces. Make a solution of 1 ounce of potassium nitrate in 12 ounces of boiling water; place this solution in a large plate, and draw each strip of paper over the solution so as to saturate it. Then dry by hanging up. The dried paper is to be saturated in a similar manner with either of the following solutions:

(1) Siam benzoin	1 ounce
Storax	3 drachms
Olibanum	2 scruples
Mastic	2 scruples
Cascarilla	2 drachms
Vanilla	1 drachm
Rectified spirit	8 ounces

Bruise the solids and macerate in the spirit 5 days, filter, and add

Oil of cinnamon	8 parts
Oil of cloves	8 parts
Oil of bergamot	5 parts
Oil of neroli	5 parts

Mix.

(2) Benzoin	1½ ounces
Sandal wood	1 ounce
Spirit	8 ounces

Macerate as No. 1, and add

Essence of vetiver	3 ounces
Oil of lemon grass	40 drops

Mix.

After the paper is dry, cut up into suitable sized pieces to go into commercial envelopes.

II.—Benzoin	1 av. ounce
Storax	1 av. ounce
Fumigating essence	2 fluidounces
Ether	1 fluidounce
Acetic acid, glacial	20 drops
Alcohol	2 fluidounces

Dissolve the benzoin and storax in a mixture of the alcohol and ether, filter and add the fumigating and the acetic acid. Spread the mixture upon filtering or bibulous paper and allow it to dry. To prevent sticking, dust the surface with talcum and preserve in wax paper. When used the paper is simply warmed, or held over a lamp.

III.—Musk	0.2	parts
Oil of rose	1	part
Benzoin	100	parts
Myrrh	12	parts
Orris root	250	parts
Alcohol (90 per cent)	500	parts

IV.—Benzoin	80	parts
Balsam Tolu	20	parts
Storax	20	parts
Sandal wood	20	parts
Myrrh	10	parts
Cascarilla bark	20	parts
Musk	0.2	parts
Alcohol	250	parts

Fumigating Ribbon.—I.—Take ½-inch cotton tape and saturate it with niter; when dry, saturate with the following tincture:

Benzoin	1 ounce
Orris root	1 ounce
Myrrh	2 drachms
Tolu balsam	2 drachms
Musk	10 grains
Rectified spirit	10 ounces

Macerate for a week, filter, and add 10 minims of attar of rose.

II.—Another good formula which may also be used for fumigating paper, is:

Olibanum	2	ounces
Storax	1	ounce
Benzoin	6	drachms
Peruvian balsam	½	ounce
Tolu balsam	3	drachms
Rectified spirit	10	ounces

Macerate 10 days, and filter.

Perfumed Fumigating Pastilles.—

I.—

Vegetable charcoal	6	ounces
Benzoin	1	ounce
Nitrate of potash	½	ounce
Tolu balsam	2	drachms
Sandal wood	2	drachms
Mucilage of tragacanth, a sufficiency.		

Reduce the solids to fine powder, mix, and make into a stiff paste with the mucilage. Divide this into cones 25 grains in weight, and dry with a gentle heat.

II.—

Powdered willow charcoal	8	ounces
Benzoic acid	6	ounces
Nitrate of potash	6	drachms
Oil of thyme	½	drachm
Oil of sandal wood	½	drachm
Oil of caraway	½	drachm
Oil of cloves	½	drachm
Oil of lavender	½	drachm
Oil of rose	½	drachm
Rose water	10	ounces

Proceed as in I, but this recipe is better for the addition of 20 grains of powdered tragacanth.

III.—

Benzoin	10	av. ounces
Charcoal	24	av. ounces
Potassium nitrate	1	av. ounce
Sassafras	2	av. ounces
Mucilage of acacia, sufficient.		

Mix the first four in fine powder, add the mucilage, form a mass, and make into conical pastilles.

IV.—

Potassium nitrate	375	grains
Water	25	fluidounces
Charcoal wood, powder	30	av. ounces
Tragacanth, powder	375	grains
Storax	300	grains
Benzoin	300	grains
Vanillin	8	grains
Coumarin	3	grains
Musk	3	grains
Civet	1½	grains
Oil of rose	20	drops
Oil of bergamot	15	drops
Oil of ylang-ylang	10	drops
Oil of rhodium	10	drops
Oil of sandal wood	5	drops
Oil of cinnamon	5	drops
Oil of orris	1	drop
Oil of cascarilla	1	drop

Saturate the charcoal with the potassium nitrate dissolved in the water, dry the mass, powder, add the other ingredients, and mix thoroughly. Beat the mixture to a plastic mass with the addition of sufficient mucilage of tragacanth containing 2 per cent of saltpeter in solution, and form into cone-shaped pastilles. In order to evenly distribute the storax throughout the mass, it may be previously dissolved in a small amount of acetic ether.

V.—

Benzoin	2	av. ounces
Cascarilla	1	av. ounce
Myrrh	1	av. ounce
Potassium nitrate	½	av. ounce
Potassium chlorate	60	grains
Charcoal, wood.	4	av. ounces
Oil of cloves	1	fluidrachm
Oil of cinnamon	1	fluidrachm
Oil of lavender.	1	fluidrachm
Mucilage of tragacanth, sufficient.		

Mix the first six ingredients previously reduced to fine powder, add the oils, and then incorporate enough mucilage to form a mass. Divide this into pastilles weighing about 60 grains and dry.

VI.—

Charcoal, powder	30	av. ounces
Potassium nitrate	½	av. ounce
Water	33	fluidounces
Tragacanth, powder	300	grains
Tincture of benzoin	1½	fluidounces
Peru balsam	300	grains
Storax, crude	300	grains
Tolu balsam	300	grains
Oleo-balsamic mixture	2½	fluidrachms
Coumarin	8	grains

Saturate the charcoal with the potassium nitrate dissolved in the water, then dry, reduce to powder, and incorporate the tragacanth and then the remaining ingredients. Form a mass by the addition of sufficient mucilage of tragacanth containing 2 per cent of potassium nitrate in solution and divide into pastilles.

VII.—

Powdered nitrate of potassium	½	ounce
Powdered gum arabic	½	ounce
Powdered cascarilla bark (fresh)	½	ounce
Powdered benzoin (fresh)	4	ounces

Powdered charcoal.	7	ounces
Oil of eucalyptus...	25	drops
Oil of cloves.....	25	drops
Water, a sufficiency.		

Make a smooth paste, press into molds and dry.

FURS:

To Clean Furs.—For dark furs, warm a quantity of new bran in a pan, taking care that it does not burn, to prevent which it must be briskly stirred. When well warmed rub it thoroughly into the fur with the hand. Repeat this 2 or 3 times, then shake the fur, and give it another sharp rubbing until free from dust. For white furs: Lay them on a table, and rub well with bran made moist with warm water; rub until quite dry, and afterwards with dry bran. The wet bran should be put on with flannel, then dry with book muslin. Light furs, in addition to the above, should be well rubbed with magnesia or a piece of book muslin, after the bran process, against the way of the fur.

To Preserve Furs.—I.—Furs may be preserved from moths and other insects by placing a little colocynth pulp (bitter apple), or spice (cloves, pimento, etc.), wrapped in muslin, among them; or they may be washed in a very weak solution of corrosive sublimate in warm water (10 to 15 grains to the pint), and afterwards carefully dried. As well as every other species of clothing, they should be kept in a clean, dry place, from which they should be taken out occasionally, well beaten, exposed to the air, and returned.

II.—Sprinkle the furs or woolen stuffs, as well as the drawers or boxes in which they are kept, with spirits of turpentine, the unpleasant scent of which will speedily evaporate on exposure of the stuffs to the air. Some persons place sheets of paper moistened with spirits of turpentine, over, under, or between pieces of cloth, etc., and find it a very effectual method. Many woolen drapers put bits of camphor, the size of a nutmeg, in papers, on different parts of the shelves in their shops, and as they brush their cloths every 2, 3, or 4 months, this keeps them free from moths; and this should be done in boxes where the furs, etc., are put. A tallow candle is frequently put within each muff when laid by. Snuff or pepper is also good.

FURNACE JACKET.

A piece of asbestos millboard—10 inches by 4 inches by ⅜ inch—is perforated in about a dozen or more places with glycerined cork borers, then nicked about an inch from each short end and immersed in water until saturated; next the board is bent from the nicks at right angles and the perforated portion shaped by bending it over a bottle with as little force as possible. The result should be a perforated arched tunnel, resting on narrow horizontal ledges at each side. Dry this cover in the furnace, after setting it in position, and pressing it well to the supports. Three such covers, weighing 1 pound, replaced 24 fire clay tiles, weighing 13 pounds, and a higher temperature was obtained than with the latter.

FURNACES, FIREPROOF CEMENT:

A paste or mortar that will close up cracks in furnaces to keep the gas from escaping can be made as follows:—Mix together 75 parts of wet fireclay, 3 parts of black oxide manganese, 3 parts of white sand, and 1 part of powdered asbestos. Thoroughly mix by adding enough water to make a smooth paste. Apply this paste over the cracks and when dry it will be as hard as iron and stick like glue.

FURNITURE FOR GARDENS:

To make imitation stone for outdoor furniture sundials, flower pots, etc., use: 10 parts lime; 12 parts rosin; 1 part linseed oil. Dissolve ingredients thoroughly and apply the mixture while hot to the wood as a coating. The result will be attractive stone-like appearance that will last indefinitely.

GAMBOGE STAIN:

See Lacquers.

GAPES IN POULTRY:

See Veterinary Formulas.

GARANCINE PROCESS:

See Dyes.

GARDENS, CHEMICAL:

See also Sponges.

I.—Put some sand into a fish-globe or other suitable glass vessel to the depth of 2 or 3 inches; in this place a few pieces of sulphate of copper, aluminum, and iron; pour over the whole a solution of sodium silicate (water glass), 1 part, and water, 3 parts, care being taken not to disarrange the chemicals. Let this stand a week or so, when a dense growth of the silicates of the various bases used will be seen in various colors. Now displace

the solution of the sodium silicate with clear water, by conveying a stream of water through a very small rubber tube into the vessel. The water will gradually displace the sodium silicate solution. Care must be taken not to disarrange or break down the growth with the stream of water. A little experimenting, experience and expertness will enable the operator to produce a very pretty garden.

II.—This is a permanent chemical garden, which may be suspended by brass chains with a lamp behind.

Prepare a small beaker or jar full of cold saturated solution of Glauber's salt, and into the solution suspend by means of threads a kidney bean and a non-porous body, such as a marble, stone, glass, etc. Cover the jar, and in a short time there will be seen radiating from the bean small crystals of sulphate of sodium which will increase and give the bean the aspect of a sea urchin, while the non-porous body remains untouched. The bean appears to have a special partiality for the crystals, which is due to the absorption of water by the bean, but not of the salt. In this way a supersaturated solution is formed in the immediate neighborhood of the bean, and the crystals, in forming, attach themselves to its surface.

III.—A popular form of ornamental crystallization is that obtained by immersing a zinc rod in a solution of a lead salt, thus obtaining the "lead tree." To prepare this, dissolve lead acetate in water, add a few drops of nitric acid, and then suspend the zinc rod in the solution. The lead is precipitated in large and beautiful plates until the solution is exhausted or the zinc dissolved. In this case the action is electro-chemical, the first portions of the lead precipitated forming with the zinc a voltaic arrangement of sufficient power to decompose the salt.

It is said that by substituting chloride of tin for the lead salt a "tin tree" may be produced, while nitrate of silver under the same conditions would produce a "silver tree." In the latter case distilled water should be used to prevent precipitation of the silver by possible impurities contained in ordinary water.

GAS FIXTURES:
See Brass.

GAS FIXTURES, BRONZING OF:
See Plating.

GAS SOLDERING:
See Soldering.

GAS-STOVES, TO CLEAN:
See Cleaning Preparations and Methods.

GAS TRICK:
See Pyrotechnics.

GEAR LUBRICANT:
See Lubricants.

GELATIN:

French Gelatin.—Gelatin is derived from two sources, the parings of skins, hides, etc., and from bones. The latter are submitted to the action of dilute hydrochloric acid for several days, which attacks the inorganic matters—carbonates, phosphates, etc., and leaves the ossein, which is, so to say, an isomer of the skin substance. The skin, parings of hide, etc., gathered from the shambles, butcher shops, etc., are brought into the factory, and if not ready for immediate use are thrown into quicklime, which preserves them for the time being. From the lime, after washing, they pass into dilute acid, which removes the last traces of lime, and are now ready for the treatment that is to furnish the pure gelatin. The ossein from bones goes through the same stages of treatment, into lime, washed and laid in dilute acid again. From the acid bath the material goes into baths of water maintained at a temperature not higher than from 175° to 195° F.

The gelatin manufacturer buys from the button-makers and manufacturers of knife handles and bone articles generally, those parts of the bone that they cannot use, some of which are pieces 8 inches long by a half inch thick.

Bones gathered by the ragpickers furnish the strongest glue. The parings of skin, hide, etc., are from those portions of bullock hides, calf skins, etc., that cannot be made use of by the tanner, the heads, legs, etc.

The gelatin made by Coignet for the Pharmacie Centrale de France is made from skins procured from the tawers of Paris, who get it directly from the abattoirs, which is as much as to say that the material is guaranteed fresh and healthy, since these institutions are under rigid inspection and surveillance of government inspectors and medical men.

There is a gelatin or glue, used exclusively for joiners, inside carpenters, and ceiling makers (*plafonneurs*), called *rabbit vermicelli*, and derived from rabbit skins. As the first treatment of these skins is to saturate them with mercury bichloride, it is needless to say the product is not employed in pharmacy.

To Clarify Solutions of Gelatin, Glues, etc.—If 1 per cent of ammonium fluoride be added to turbid solutions of gelatin or common glue, or, in fact, of any gums, it quickly clarifies them. It causes a deposition of ligneous matter, and also very materially increases the adhesive power of such solutions.

Air Bubbles in Gelatin.—The presence of minute air bubbles in cakes of commercial gelatin often imparts to them an unpleasant cloudy appearance. These minute air bubbles are the result of the rapid, continuous process of drying the sheets of gelatin by a counter-current of hot air. Owing to the rapid drying a hard skin is formed on the outside of the cake, leaving a central layer from which the moisture escapes only with difficulty, and in which the air bubbles remain behind. Since the best qualities of gelatin dry most rapidly, the presence of these minute bubbles is, to a certain extent, an indication of superiority, and they rarely occur in the poorer qualities of gelatin. If dried slowly in the old way gelatin is liable to be damaged by fermentation; in such cases large bubbles of gas are formed in the sheets, and are a sign of bad quality.

GEMS, ARTIFICIAL:

See also Diamonds.

The raw materials for the production of artificial gems are the finest silica and, as a rule, finely ground rock crystals; white sand and quartz, which remain pure white even at a higher temperature, may also be used.

Artificial borax is given the preference, since the native variety frequently contains substances which color the glass. Lead carbonate or red lead must be perfectly pure and not contain any protoxide, since the latter gives the glass a dull, greenish hue. White lead and red lead have to dissolve completely in dilute nitric acid or without leaving a residue; the solution, neutralized as much as possible, must not be reddened by prussiate of potash. In the former case tin is present, in the latter copper. Arsenious acid and saltpeter must be perfectly pure; they serve for the destruction of the organic substances. The materials, without the coloring oxide, furnish the starting quantity for the production of artificial gems; such glass pastes are named "strass."

The emerald, a precious stone of green color, is imitated by melting 1,000 parts of strass and 8 parts of chromic oxide. Artificial emeralds are also obtained with cupric acid and ferric oxides, consisting of 43.84 parts of rock crystal; 21.92 parts of dry sodium carbonate; 7.2 parts of calcined and powdered borax; 7.2 parts of red lead; 3.65 parts of saltpeter; 1.21 parts of red ferric oxide, and 0.6 parts of green copper carbonate.

Agates are imitated by allowing fragments of variously colored pastes to flow together, and stirring during the deliquation.

The amethyst is imitated by mixing 300 parts of a glass frit with 0.6 parts of gray manganese ore, or from 300 parts of frit containing 0.8 per cent of manganic oxide, 36.5 parts of saltpeter, 15 parts of borax, and 15 parts of minium (red lead). A handsome amethyst is obtained by melting together 1,000 parts of strass, 8 parts of manganese oxide, 5 parts of cobalt oxide, and 2 parts of gold purple.

Latterly, attempts have also been made to produce very hard glasses for imitation stones from alumina and borax with the requisite coloring agents.

Besides imitation stones there are also produced opaque glass pastes bearing the name of the stones they resemble, e. g., aventurine, azure-stone (lapis lazuli), chrysoprase, turquoise, obsidian, etc. For these, especially pure materials, as belonging to the most important ingredients of glassy bodies, are used, and certain quantities of red lead and borax are also added.

GEM CEMENTS:

See Adhesives, under Jewelers' Cements.

GERMAN SILVER:

See Alloys.

GERMAN SILVER SOLDERS:

See Solders.

GILDING:

See Paints, Plating, and Varnishes.

GILDING GLASS:

See Glass.

GILDING, TO CLEAN:

See Cleaning Preparations and Methods.

GILDING, RENOVATION OF:

See Cleaning Compounds.

GILDING SUBSTITUTE:

See Plating.

GILT, TEST FOR:

See Gold.

GILT WORK, TO BURNISH:

See Gold.

Glass

GLASS GRINDING FLUID:

Turpentine	40 c.c.
Ether	22 c.c.
Camphor	30 grams

Moisten the glass with the fluid and add powdered emery as needed.

Bent Glass.—This was formerly used for show cases; its use in store fronts is becoming more and more familiar, large plates being bent for this purpose. It is much used in the construction of dwellings, in windows, or rounded corners, and in towers; in coach fronts and in rounded front china closets. Either plain glass or beveled glass may be bent, and to any curve.

The number of molds required in a glass-bending establishment is large.

The bending is done in a kiln. Glass melts at 2,300° F.; the heat employed in bending is 1,800° F. No pyrometer would stand long in that heat, so the heat of the kiln is judged from the color of the flame and other indications. Smaller pieces of glass are put into the molds in the kilns with forks made for the purpose. The great molds used for bending large sheets of glass are mounted on cars, that may be rolled in and out of kilns. The glass is laid upon the top of the mold or cavity, and is bent by its own weight. As it is softened by the heat it sinks into the mold and so is bent. It may take an hour or two to bend the glass, which is then left in the kiln from 24 to 36 hours to anneal and cool. Glass of any kind or size is put into the kilns in its finished state; the great heat to which it is subjected does not disturb the polished surface. Despite every precaution more or less glass is broken in bending. Bent glass costs about 50 per cent more than the flat.

The use of bent glass is increasing, and there are 4 or 5 glass-bending establishments in the United States, of which one is in the East.

Colored Glass.—R. Zsigmondy has made some interesting experiments in coloring glass with metallic sulphides, such as molybdenite, and sulphides of antimony, copper, bismuth, and nickel. Tests made with batches of 20 to 40 pounds and with a heat not too great, give good results as follows:

Sand, 65 parts; potash, 15 parts; soda, 5 parts; lime, 9 parts; molybdenite, 3 parts; sulphide of sodium, 2 parts, gave a dark reddish-brown glass. In thinner layers this glass appeared light brownish yellow. Flashed with opal, it became a smutty black brown.

Sand, 50 parts; potash, 15 parts; soda, 5 parts; lime, 9 parts; molybdenite, 1 part; sulphide of sodium, 2 parts, gave a yellow glass.

Sand, 10 parts; potash, 3.3 parts; soda, 0.27 parts; lime, 1.64 parts; molybdenite, 0.03 parts, gave a reddish-yellow glass with a fine tinge of red.

Sand, 100 parts; potash, 26 parts; soda, 108 parts; lime, 12 parts; sulphide of copper, 1.7 parts; sulphide of sodium, 2.3 parts, gave a dark-brown color, varying from sepia to sienna. In thick layers it was no longer transparent, but still clear and unclouded. When heated this glass became smutty black brown and clouded.

A fine copper red was obtained from sand, 10 parts; potash, 3 parts; lime, 1.2 parts; soda, 0.25 parts; sulphide of copper, 7.5 parts; sulphide of sodium, 10.5 parts; borax, 9.5 parts.

Attempts to color with sulphides of antimony and bismuth failed. But the addition of 7 per cent of sulphide of nickel to an ordinary batch gave a glass of fine amethyst color.

Coloring Electric-Light Bulbs and Globes.—Two substances suggest themselves as excellent vehicles of color, and both water soluble—water glass (potassium or sodium silicate) and gelatin. For tinting, water-soluble aniline colors should be tried. The thickness of the solution must be a matter of experimentation. Prior to dipping the globes they should be made as free as possible from all grease, dirt, etc. The gelatin solution should not be so thick that any appreciable layer of it will form on the surface of the glass, and to prevent cracking, some non-drying material should be added to it, say glycerine.

Rose-Tint Glass.—Selenium is now used for coloring glass. Rose-tinted glass is made by adding selenium directly to the ingredients in the melting pot. By mixing first with cadmium sulphide, orange red is produced. This process is stated not to require the reheating of the glass and its immersion in the coloring mixture, as in the ordinary process of making red glass.

CUTTING, DRILLING, GRINDING, AND SHAPING GLASS:

To Cut Glass.—I.—Glass may be cut without a diamond. Dip a piece of

common string in alcohol and squeeze it reasonably dry. Then tie the string tightly around the glass on the line of cutting. Touch a match to the string and let it burn off. The heat of the burning string will weaken the glass in this particular place. While it is hot plunge the glass under water, letting the arm go well under to the elbow, so there will be no vibration when the glass is struck. With the free hand strike the glass outside the line of cutting, giving a quick, sharp stroke with a stick of wood, a long-bladed knife, or the like, and the cut will be as clean and straight as if made by a regular glass cutter.

The same principle may be employed to cut bottles into vases, and to form all sorts of pretty things, such as jewelry boxes, picture panes, trays, small tablets, windows for a doll house, etc.

II.—Scratch the glass around the shape you desire with the corner of a file or graver; then, having bent a piece of wire into the same shape, heat it red hot and lay it upon the scratch and sink the glass into cold water just deep enough for the water to come almost on a level with its upper surface. It will rarely fail to break perfectly true.

To Cut Glass Under Water.—It is possible to cut a sheet of glass roughly to any desired shape with an ordinary pair of scissors, if the operation be performed under water. Of course, a smooth edge cannot be obtained by such means, but it will be found satisfactory.

Drilling, Shaping, and Filing Glass.—Take any good piece of steel wire, file to the shape of a drill, and then hold it in a flame till it is at a dull red heat; then quench in metallic mercury. A piece of good steel, thus treated, will bore through glass almost as easily as through soft brass. In use, lubricate with oil of turpentine in which camphor has been dissolved. When the point of the drill has touched the other side put the glass in water, and proceed with the drilling very slowly. If not possible to do this, reverse the work—turn the glass over and drill, very carefully, from the opposite side. By proceeding with care you can easily drill three holes through glass $\frac{3}{16}$ inch thick $\frac{1}{4}$ of an inch apart. In making the drill be careful not to make the point and the cutting edges too acute. The drill cuts more slowly, but more safely, when the point and cutting edges are at a low angle.

To Make Holes in Thin Glass.—To produce holes in panes of thin or weak glass, provide the places to be perforated with a ring of moist loam, whose center leaves free a portion of glass exactly the size of the desired hole. Pour molten lead into the ring, and the glass and lead will fall through at once. This process is based upon the rapid heating of the glass.

To Grind Glass.—For the grinding of glass, iron, or steel laps and fine sand are first used; after that, the sand is replaced by emery. Then the polishing is started with pure lead or pure tin laps, and finished with willow wood laps. The polishing powder is tin putty, but peroxide of iron or dioxide of tin is a good polishing medium.

Pohl asserts that if glass is polished with crocus (Paris red) it appears of a dark or a yellowish-brown tint. He contends that the crocus enters the pores of the glass, and, to prevent this, he uses zinc white with the most satisfactory results.

A Home-Made Outfit for Grinding Glass.—Provide two pieces of cork, one concave and one convex (which may be cut to shape after fitting to the lathe). Take a copper cent or other suitable article and soft-solder a screw to fit the lathe, and then wax it to the cork; get a cheap emery wheel, such as is used on sewing machines. Polish the edge on the zinc collar of the emery wheel (or use a piece of zinc). The other cork should be waxed to a penny and centered. Spectacle lenses may be cut on the same emery wheel if the wheel is attached to the lathe so as to revolve. Another method is to take a common piece of window glass (green glass is the best) and make a grindstone of that, using the flat surface for grinding. Cement it on a large chuck, the glass being from 2 to $2\frac{1}{2}$ inches in diameter.

To Drill Optical Glass.—A graver sharpened to a long point is twisted between the fingers, and pressed against the glass, the point being moistened from time to time with turpentine. When the hole is finished half way, the drilling should be commenced from the other side. The starting should be begun with care, as otherwise the graver is likely to slide out and scratch the lens. It is advisable to mark the point of drilling with a diamond, and not to apply too great a pressure when twisting the graver.

Lubricants for Glass Drilling.—I.—Put garlic, chopped in small pieces, into spirit of turpentine and agitate the mix-

ture from time to time. Filter at the end of a fortnight, and when you desire to pierce the glass dip your bit or drill into this liquid, taking care to moisten it constantly to prevent the drill, etc., from becoming heated.

II.—Place a little alum in acetic acid, dip your drill into this and put a drop of it on the spot where the glass is to be pierced.

GILDING GLASS.

When it is desired to gild glass for decorative purposes use a solution of gelatin in hot water, to which an equal quantity of alcohol has been added. The glass to be gilded is covered with this solution and the gold leaf put on while wet. A sheet of soft cotton must be pressed and smoothed over the leaf until the gelatin below is evenly distributed. This prevents spots in gilding. Careful apportionment of the gelatin is necessary. If too much be used, the gold may become spotted; if too little, the binding may be too weak to allow the gold to be polished. The glass should be cleaned thoroughly before gilding. After the gold leaf is put on the whole is allowed to dry for 10 or 20 minutes, when the luster of the gold can be raised by a cautious rubbing with cotton. Then another layer of gelatin is spread on with one stroke of a soft brush, and, if especially good work be required, a second layer of gold is put on and covered as before. In this case, however, the gelatin is used hot. After the gilding has become perfectly dry the letters or ornamentation are drawn and the surplus gold around the edges is taken off. The gilding does not become thoroughly fixed until after several months, and until then rough handling, washing, etc., should be avoided.

The best backing for glass gilding is asphaltum, with a little lampblack, this to be mixed up with elastic varnish; outside finishing varnish is the best, as the addition of this material gives durability.

GLASS MANUFACTURING:

See also Ceramics.

The blue tint of the common poison bottle is got by the addition of black oxide of cobalt to the molten glass; the green tint of the actinic glass bottle is obtained in the same way by the addition of potassium bichromate, which is reduced to the basylous condition, and the amber tint is produced by the addition of impure manganese dioxide, a superior tint being produced by suphur in one form or another. The formulas for various kinds of bottle glass, which indicate the general composition of almost all glasses, are:

White Glass for Ordinary Molded Bottles.—

Sand	64	Parts by weight.
Lime	6	
Carbonate of sodium	23	
Nitrate of sodium	5	

White Flint Glass Containing Lead.—

Sand	63	Parts by weight.
Lime	5	
Carbonate of sodium	21	
Nitrate of sodium	3	
Red lead	8	

Ordinary Green Glass for Dispensing Bottles.—

Sand	63	Parts by weight.
Carbonate of sodium	26	
Lime	11	

A mixture for producing a good green flint glass is much the same as that for the ordinary white flint glass, except that the lime, instead of being the purest, is ordinary slaked lime, and the sodium nitrate is omitted. Sand, lime, and sodium carbonate are the ordinary bases of glass, while the sodium nitrate is the decolorizing agent.

Glass Refractory to Heat.—Fine sand, 70 parts; potash, 30 parts; kaolin, 25 parts.

Transparent Ground Glass.—Take hold of the glass by one corner with an ordinary pair of fire tongs. Hold it in front of a clear fire, and heat to about 98° F., or just hot enough to be held comfortably in the hand. Then hold the glass horizontally, ground side uppermost, and pour in the center a little photographer's dry-plate negative varnish. Tilt the glass so that the varnish spreads over it evenly, then drain back the surplus varnish into the bottle from one corner of the glass. Hold the glass in front of the fire again for a few minutes and the varnish will crystallize on its surface, making it transparent. The glass should not be made too hot before the varnish is put on, or the varnish will not run evenly. This method answers very well for self-made magic-lantern slides. Ground glass may be made temporarily transparent by wiping with a sponge dipped in paraffine or glycerine.

WATER-TIGHT GLASS:

Water-Tight Glass Roofs.—Glass roofs, the skeletons of which are constructed

of iron, are extremely difficult to keep water-tight, as the iron expands and contracts with atmospheric changes. To meet this evil, it is necessary to use an elastic putty, which follows the variations of the iron. A good formula is: Two parts rosin and one part tallow, melted together and stirred together thoroughly with a little minium. This putty is applied hot upon strips of linen or cotton cloth, on top and below, and these are pasted while the putty is still warm, with one edge on the iron ribs and the other, about one-fourth inch broad, over the glass.

Tightening Agent for Acid Receptacles.—Cracked vessels of glass or porcelain, for use in keeping acids, can be made tight by applying a cement prepared in the following manner: Take finely sifted sand, some asbestos with short fiber, a little magnesia and add enough concentrated water glass to obtain a readily kneadable mass. The acid renders the putty firm and waterproof.

PENCILS FOR MARKING GLASS:

See also Etching and Frosted Glass.

Crayons for Writing on Glass.—I.—The following is a good formula:

Spermaceti	4 parts
Tallow	3 parts
Wax	2 parts
Red lead	6 parts
Potassium carbonate	1 part

Melt the spermaceti, tallow, and wax together over a slow fire, and when melted stir in, a little at a time, the potassium carbonate and red lead, previously well mixed. Continue the heat for 20 or 30 minutes, stirring constantly. Withdraw from the source of heat, and let cool down somewhat, under constant stirring, at the temperature of about 180° F.; before the mixture commences to set, pour off into molds and let cool. The latter may be made of bits of glass tubing of convenient diameter and length. After the mixture cools, drive the crayons out by means of a rod that closely fits the diameter of the tubes.

II.—Take sulphate of copper, 1 part, and whiting, 1 part. Reduce these to a fine powder and mix with water; next roll this paste into the shape of crayons and let dry. When it is desired to write on the glass use one of these crayons and wipe the traced designs. To make them reappear breathe on the glass.

III.—Melt together, spermaceti, 3 parts; talc, 3 parts, and wax, 2 parts. When melted stir in 6 parts of minium and 1 part of caustic potash. Continue heating for 30 minutes, then cast in suitable molds. When formed and ready to be put away dust them with talc powder, or roll each pencil in paraffine powder.

PREVENTION OF FOGGING, DIMMING, AND CLOUDING.

I.—Place a few flat glass or porcelain dishes with calcium chloride in each window. This substance eagerly absorbs all moisture from the air. The contents of the dishes have to be renewed every 2 or 3 days, and the moist calcium chloride rigorously dried, whereupon it may be used over again.

II.—Apply to the inside face of the glass a thin layer of glycerine, which does not permit the vapor to deposit in fine drops and thus obstruct the light. Double glass may also be used. In this way the heat of the inside is not in direct contact with the cold outside.

III.—By means of the finger slightly moistened, apply a film of soap of any brand or kind to the mirror; then rub this off with a clean, dry cloth; the mirror will be as bright and clear as ever; breathing on it will not affect its clearness.

IV.—Window glass becomes dull during storage by reason of the presence of much alkali. This can be avoided by taking sand, 160 parts; calcined sodium sulphate, 75; powdered marble, 50; and coke, 4 to 5 parts. About 3 parts of the sodium sulphate may be replaced by an equal quantity of potash.

FROSTED GLASS.

I.—A frosted appearance may be given to glass by covering it with a mixture of

Magnesium sulphate	6 ounces
Dextrin	2 ounces
Water	20 ounces

When this solution dries, the magnesium sulphate crystallizes in fine needles.

II.—Another formula directs a strong solution of sodium or magnesium sulphate, applied warm, and afterwards coated with a thin solution of acacia.

III.—A more permanent "frost" may be put on the glass by painting with white lead and oil, either smooth or in stipple effect. The use of lead acetate with oil gives a more pleasing effect, perhaps, than the plain white lead.

IV.—If still greater permanency is desired, the glass may be ground by rubbing with some gritty substance.

V.—For a temporary frosting, dip a piece of flat marble into glass cutter's sharp sand, moistened with water; rub over the glass, dipping frequently in sand and water. If the frosting is required very fine, finish off with emery and water. Mix together a strong, hot solution of Epsom salt and a clear solution of gum arabic; apply warm. Or use a strong solution of sodium sulphate, warm, and when cool, wash with gum water. Or daub the glass with a lump of glazier's putty, carefully and uniformly, until the surface is equally covered. This is an excellent imitation of ground glass, and is not disturbed by rain or damp.

VI.—This imitates ground glass:

Sandarac.....	2½ ounces
Mastic.....	½ ounce
Ether.....	24 ounces
Benzine.....16 to 18	ounces

VII.—Take white lead ground in a mixture of ¾ varnish and ¼ oil of turpentine, to which burnt white vitriol and white sugar of lead are added for drier. The paint must be prepared exceedingly thin and applied to the glass evenly, using a broad brush. If the windows require a new coat, the old one is first removed by the use of a strong lye, or else apply a mixture of hydrochloric acid, 2 parts; vitriol, 2 parts; copper sulphate, 1 part; and gum arabic 1 part, by means of a brush. The production of this imitation frosting entails little expense and is of special advantage when a temporary use of the glass is desired.

VIII.—A little Epsom salt (sulphate of magnesia) stirred in beer with a small dose of dextrin and applied on the panes by means of a sponge or a brush permits of obtaining mat panes.

Hoarfrost Glass.—The feathery foams traced by frost on the inside of the windows in cold weather may be imitated as follows:

The surface is first ground either by sand-blast or the ordinary method, and is then covered with a sort of varnish. On being dried either in the sun or by artificial heat, the varnish contracts strongly, taking with it the particles of glass to which it adheres; and as the contraction takes places along definite lines, the pattern given by the removal of the particles of glass resembles very closely the branching crystals of frostwork. A single coat gives a small, delicate effect, while a thick film, formed by putting on 2, 3 or more coats, contracts so strongly as to produce a large and bold design. By using colored glass, a pattern in half-tint may be made on the colored ground, and after decorating white glass, the back may be silvered or gilded.

Engraving, Matting, and Frosting.—Cover the glass with a layer of wax or of varnish on which the designs are traced with a graver or pen-point; next, hydrofluoric acid is poured on the tracings. This acid is very dangerous to handle, while the following process, though furnishing the same results, does not present this drawback: Take powdered fluoride of lime, 1 part, and sulphuric acid, 2 parts. Make a homogeneous paste, which is spread on the parts reserved for the engraving or frosting. At the end of 3 or 4 hours wash with water to remove the acid, next with alcohol to take off the varnish, or with essence of turpentine if wax has been employed for stopping off.

To Render Window Panes Opaque.—I.—Panes may be rendered mat and non-transparent by painting them on one side with a liquid prepared by grinding whiting with potash water-glass solution. After one or two applications, the panes are perfectly opaque, while admitting the light.

II.—Paint the panes with a solution of

Dextrin.....	200	Parts by weight.
Zinc vitriol.....	800	
Bitter salt.....	300	
In water.....	2,000	

III.—For deadening panes already set in frames the following is suitable: Dissolve 1 part of wax in 10 parts of oil of turpentine, adding 1 part of varnish and 1 part of siccative. With this mixture coat the panes on the outside and dab, while still wet, with a pad of cotton wadding. If desired small quantities of Paris blue, madder lake, etc., may be added to the wax solution.

IV.—For deadening window panes in factories and workshops: To beeswax dissolved in oil of turpentine, add some dryer and varnish to obtain a quicker drying and hardening. After the window pane has been coated with this mixture on the outside, it is dabbed uniformly with a pad of wadding. The wax may be tinted with glazing colors.

Frosted Mirrors.—I.—Cover with a solution of Epsom salts in stale beer; apply with a sponge to the mirror, first wiping it clean and dry. On drying, the Epsom salt crystallizes, giving very handsome frosted effects, but the solution must not be applied on humid days

when the glass is liable to be damp, for in that case the effect will be a blurred one. When it is desirable to remove the coating, lukewarm water will serve the purpose without damage to the luster of the mirror.

II.—The following mixture, when applied to a mirror and left to dry, will form in many shapes, all radiating from a focus, this focus forming anywhere on the glass, and when all dry tends to form a most pleasing object to the eye.

Sour ale..... 4 ounces
Magnesium sulphate. 1 ounce

Put on the mirror with a small, clean sponge and let dry. It is now ready for the artist, and he may choose his own colors and subject.

Crystalline Coatings or Frostwork on Glass or Paper.—Dissolve a small quantity of dextrin (gum arabic and tragacanth are not so suitable) in aqueous salt solution as concentrated as possible, for instance, in sulphate of magnesia (bitter salt), sulphate of zinc or any other readily crystallizing salt; filter the solution through white blotting paper and coat glass panes uniformly thin with the clear filtrate, using a fine, broad badger brush; leave them lying at an ordinary medium temperature about one-quarter hour in a horizontal position.

As the water slowly evaporates during this short time, handsome crystalline patterns, closely resembling frostwork, will develop gradually on the glass panes, which adhere so firmly to the glass or the paper (if well-sized glazed paper had been used) that they will not rub off easily. They can be permanently fixed by a subsequent coat of alcoholic shellac solution.

Especially handsome effects are produced with colored glass panes thus treated, and in the case of reflected light by colored paper.

For testing crystals as regards their optical behavior, among others their behavior to polarized light, it is sufficient to pour a solution of collodion wool (soluble peroxide lime for the preparation of collodion) over the surface of glass with the crystalline designs, and to pull off the dry collodion film carefully. If this is done cautiously it is not difficult to lift the whole crystalline group from the glass plate and to incorporate it with the glass-like, thin collodion film.

REMOVING WINDOW FROST.

Here are fourteen methods of preventing frost on windows, arranged in the order of their efficacy: 1, Flame of an alcohol lamp; 2, sulphuric acid; 3, aqua ammonia; 4, glycerine; 5, aqua regia; 6, hydrochloric acid; 7, benzine; 8, hydrocyanic acid; 9, boric acid; 10, alcohol; 11, nitric acid; 12, cobalt nitrate; 13, infusion of nutgalls; 14, tincture of ferrous sulphate. By the use of an alcohol lamp (which, of course, has to be handled with great care) the results are immediate, and the effect more nearly permanent than by any other methods. The sulphuric acid application is made with a cotton cloth swab, care being taken not to allow any dripping, and so with all other acids. The effect of the aqua ammonia is almost instantaneous, but the window is frosted again in a short time. With the glycerine there are very good results—but slight stains on the window which may be easily removed.

The instructions for glycerine are: Dissolve 2 ounces of glycerine in 1 quart of 62 per cent alcohol containing, to improve the odor, some oil of amber. When the mixture clarifies it is rubbed over the inner surface of the glass. This, it is claimed, not only prevents the formation of frost, but also prevents sweating.

To Prevent Dimming of Eyeglasses, etc.—Mix olein-potash soap with about 3 per cent of glycerine and a little oil turpentine. Similar mixtures have also been recommended for polishing physicians' reflectors, show-windows, etc., to prevent dimming.

WRITING ON GLASS:

See also Etching and Inks.

Composition for Writing on Glass.—To obtain mat designs on glass, take sodium fluoride, 35 parts; potassium sulphate, 7 parts; zinc chloride, 15 parts; hydrochloric acid, 65 parts; distilled water, 1,000 parts. Dissolve the sodium fluoride and the potassium sulphate in half the water; dissolve the zinc chloride in the remaining water and add the hydrochloric acid. Preserve these two solutions separately. For use, mix a little of each solution and write on the glass with a pen or brush.

Ink for Writing on Glass.—

Shellac.....	20 parts
Alcohol.....	150 parts
Borax.....	35 parts
Water.....	250 parts
Water-soluble dye	sufficient to color.

Dissolve the shellac in the alcohol, the borax in the water, and pour the shellac

solution slowly into that of the borax. Then add the coloring matter previously dissolved in a little water.

GLASS SUBSTITUTE (Duro-Glass):

Celluloid scrap	3 to 4 ounces
Acetone	1 quart

Use scrap celluloid such as can be had from automobile repair shops, film exchanges or other users of celluloid. Break the celluloid into small pieces, place in a mason jar and fill the jar with acetone. Screw the top on tight to prevent evaporation.

Acetone is very inflammable, so keep it away from open flame and sparks of any kind. Set jar in a cool place and shake it frequently for about 24 hours, after which the celluloid should be dissolved. The mixture when complete, should be about the consistency of ordinary mixed paint. If it is too thick, add more acetone. It may be colored, if desired, by adding a little aniline dye and blending thoroughly.

To apply the coating use ordinary unpainted wire window screening.

Do work if possible in the open air to allow fumes to escape. Pour solution in a trough, wood or metal, long enough to accommodate width of screen, run screen through solution slowly, holding the screen that has been immersed upright so it will drain off surplus solution back into tank. If the solution is of proper consistency work will turn out perfectly.

When mixture starts to dry it appears dirty and greasy, but after it is thoroughly dry the surface will clear up and each square will be filled with a thin celluloid film. After it is dry the Duro-Glass may be cut, rolled and tacked in place, the same as before the screen was treated. It is used for sun parlors, summer camps, sleeping porches, barns, poultry houses, greenhouses, etc.

Glazes

(See also Ceramics, Enamels, Paints, and Varnishes.)

Glazes for Cooking Vessels.—Melt a frit of red lead, 22.9 parts (by weight); crystallized boracic acid, 31 parts; enamel soda, 42.4 parts; cooking salt, 10 parts; gravel, 12 parts; feldspar, 8 parts. According to the character of the clay, this frit is mixed with varying quantities of sand, feldspar and kaolin, in the following manner:

Frit	84	84	84	84
Red lead	1.5	1.5	1.5	1.5
Gravel	8	6	3	——
Feldspar	——	2	5	8
Kaolin, burnt	6.5	6.5	6.5	6.5

Glazes which are produced without addition of red lead to the frit, are prepared as follows. Melt a frit of the following composition: Red lead, 22.9 parts (by weight); boracic acid in crystals, 24.8 parts; enamel soda, 37.1 parts; calcined potash, 6.9 parts; cooking salt, 10 parts; chalk, 10 parts; gravel, 12 parts; feldspar, 8 parts.

From the frit the following glazes are prepared:

Frit	86.5	86.5	86.5	86.5
Gravel	7	4.5	3	——
Feldspar	——	2.5	4	7
Kaolin, burnt	6.5	6.5	6.5	6.5

Glazing on Size Colors.—The essential condition for this work is a well-sized foundation. For the glazing paint, size is likewise used as a binder, but a little dissolved soap is added, of about the strength employed for coating ceilings. Good veining can be done with this, and a better effect can be produced in executing pieces which are to appear in relief, such as car-touches, masks, knobs, etc., than with the ordinary means. A skillful grainer may also impart to the work the pleasant luster of natural wood. The same glazing method is applicable to colored paintings. If the glazing colors are prepared with wax, dissolved in French turpentine, one may likewise glaze with them on a size-paint ground. Glazing tube-oil colors thinned with turpentine and siccative, are also useful for this purpose. For the shadows, asphalt and Van Dyke brown are recommended, while the contour may be painted with size-paint.

Coating Metallic Surfaces with Glass.—Metallic surfaces may be coated with glass by melting together 125 parts (by weight) of flint-glass fragments, 20 parts of sodium carbonate, and 12 parts of boracic acid. The molten mass is next poured on a hard and cold surface, stone or metal. After it has cooled, it is powdered. Make a mixture of 50° Bé. of this powder and sodium silicate (water glass). The metal to be glazed is coated with this and heated in a muffle or any other oven until the mixture melts and can be evenly distributed. This glass coating adheres firmly to iron and steel.

Glaze for Bricks.—A glazing color for bricks patented in Germany is a compo-

sition of 12 parts (by weight) lead; 4 parts litharge; 3 parts quartzose sand; 4 parts white argillaceous earth; 2 parts kitchen salt; 2 parts finely crushed glass, and 1 part saltpeter. These ingredients are all reduced to a powder and then mixed with a suitable quantity of water. The color prepared in this manner is said to possess great durability, and to impart a fine luster to the bricks.

GLAZES FOR LAUNDRY:
See Laundry Preparations.

GLOBES, HOW TO COLOR:
See Glass-Coloring.

GLOBES, PERCENTAGE OF LIGHT ABSORBED BY:
See Light.

GLOBES, SILVERING OF:
See Mirrors.

GLOSS FOR PAPER:
See Paper.

Glue

(Formulas for Glues and methods of manufacturing Glue will be found under Adhesives.)

GLUE, TO PREVENT FROM CRUSTING IN GLUE POTS:

Clean glue pot thoroughly and then wipe entire inside of glue pot with a handful of waste previously soaked in any light mineral oil. As oil and glue will not mix the film of oil on the sides of the glue pot keeps the glue from sticking to and "crusting up."

Rendering Glue Insoluble in Water.—Stuebling finds that the usual mixture of bichromate and glue when used in the ordinary way does not possess the waterproof properties with which it is generally credited. If mixed in the daylight, it sets hard before it can be applied to the surfaces to be glued, and if mixed and applied in the dark room it remains just as soluble as ordinary glue, the light being unable to penetrate the interior of the joints. Neither is a mixture of linseed oil and glue of any use for this purpose. Happening to upset a strong solution of alum—prepared for wood staining—into an adjacent glue pot, he stirred up the two together out of curiosity and left them. Wishing to use the glue a few days later, he tried to thin it down with water, but unsuccessfully, the glue having set to a waterproof mass. Fresh glue was then mixed with alum solution and used to join two pieces of wood, these resisting the action of the water completely.

To Bleach Glue.—Dissolve the glue in water, by heat, and while hot, add a mixture in equal parts of oxalic acid and zinc oxide, to an amount equal to about 1 per cent of the glue. After the color has been removed, strain through muslin.

Method of Purifying Glue.—The glue is soaked in cold water and dissolved in a hot 25 per cent solution of magnesium sulphate. The hot solution is filtered, and to the filtrate is added a 25 per cent solution of magnesium sulphate containing 0.5 per cent of hydrochloric acid (or, if necessary, sulphuric acid). A white flocculent precipitate is obtained which is difficult to filter. The remainder of the glue in the saline solution is extracted by treatment with magnesium sulphate.

The viscous matter is washed, then dissolved in hot water, and allowed to cool, a quantity of weak alcohol acidulated by 1 per cent of hydrochloric acid being added just before the mass solidifies. From 2 to 3 parts, by volume, of strong alcohol (methyl or ethyl) are then added and the solution filtered, charcoal being used if necessary. The glue is finally precipitated from this solution by neutralizing with ammonia and washing with alcohol or water.

To Distinguish Glue and Other Adhesive Agents.—The product to be examined is heated with hydrofluoric acid (50 per cent). If bone glue is present in any reasonable quantity, an intense odor of butyric acid arises at once, similar to that of Limburger cheese. But if dextrin or gum arabic is present, only an odor of dextrine or fluorhydric acid will be perceptible. Conduct the reaction with small quantities; otherwise the smell will be so strong that it is hard to remove from the room.

GLUE CLARIFIER:
See Gelatin.

Glycerine

Recovering Glycerine from Soap Boiler's Lye.—I.—Glycerine is obtained as a by-product in making soap. For many years the lyes were thrown away as waste, but now considerable quantities of glycerine are recovered, which are much used in making explosive compounds.

When a metallic salt or one of the alkalies, as caustic soda, is added to tallow, a stearite of the metal (common soap is stearite of sodium) is formed, whereby the glycerine is eliminated.

This valuable by-product is contained in the waste lye, and has formed the subject of several patents.

Draw the lye off from the soap-pans; this contains a large quantity of water, some salt and soap and a small quantity of glycerine, and the great trouble is to concentrate the lye so that the large quantity of water is eliminated, sometimes 10 to 12 days being occupied in doing this. The soap and salt are easily removed.

To remove the soap, run the lye into a series of tanks alternating in size steplike, so that as the first, which should be the largest, becomes full, the liquor will flow into the second, from that into the third, and so on; by this arrangement the rosinous and albuminous matters will settle, and the soap still contained in the lyes will float on the surface, from which it is removed by skimming.

After thus freeing the lye of the solid impurities, convey the purified lye to the glycerine recovering department (wooden troughs or pipes may be used to do this), and after concentrating by heating it in a steam-jacketed boiler, and allowing it to cool somewhat, ladle out the solid salt that separates, and afterwards concentrate the lye by allowing it to flow into a tank, but before doing so let the fluid come in contact with a hot blast of air or superheated steam, whereby the crude discolored glycerine is obtained. This is further purified by heating with animal charcoal to decolorize it, then distilling several times in copper stills with superheated steam. The chief points to attend to are: (1) The neutralizing and concentrating the lye as much as possible and then separating the salts and solid matters; (2) concentrating the purified lye, and mixing this fluid with oleic acid, oil, tallow, or lard, and heating the mixture to 338° F., in a still, by steam, and gradually raise the heat to 372° F.; (3) stirring the liquor while being heated, and allowing the aqueous vapor to escape, and when thus concentrated, saponifying the liquid with lime to eliminate the glycerine; water is at the same time expelled, but this is removed from the glycerine by evaporating the mixture.

II.—In W. E. Garrigues's patent for the recovering of glycerine from spent soap lyes, the liquid is neutralized with a mineral acid, and after separation of the insoluble fatty acids it is concentrated and then freed from mineral salts and volatile fatty acids, and the concentrated glycerine solution treated with an alkaline substance and distilled. Thus the soap lye may be neutralized with sulphuric acid, and aluminum sulphate added to precipitate the insoluble fatty acids. The filtrate from these is concentrated and the separated mineral salts removed, after which barium chloride is added and then sufficient sulphuric acid to liberate the volatile fatty acids combined with the alkali. These acids are partially enveloped in the barium sulphate, with which they can be separated from the liquid by filtration, while the remaining portion can be expelled by evaporating the liquid in a vacuum evaporator. Finally, the solution is treated with sodium carbonate, and the glycerine distilled.

Glycerine Lotion.—

Glycerine	4 ounces
Essence bouquet	¼ ounce
Water	4 ounces
Cochineal coloring,	a sufficient quantity.

(See also Cosmetics for Glycerine Lotions.)

GLYCERINE APPLICATIONS:
See Cosmetics.

GLYCERINE AS A DETERGENT:
See Cleaning Preparations and Methods.

GLYCERINE PROCESS:
See Photography.

GLYCERINE SOAP:
See Soap.

GLYCERINE DEVELOPER:
See Photography.

Gold

(See also Jewelers' Formulas.)

Gold Printing on Oilcloth and Imitation Leather.—Oilcloth can very easily be gilt if the right degree of heat is observed. After the engraving has been put in the press, the latter is heated slightly, so that it is still possible to lay the palm of the hand on the heated plate without any unpleasant sensation. Go over the oilcloth with a rag in which a drop of olive oil has been rubbed up, which gives a greasy film. No priming with white of egg or any other priming agent should be done, since the gold leaf would stick. Avoid sprinkling on gilding powder. The gold leaf is applied directly on the oilcloth; then place in the lukewarm press, squeezing it down with

a quick jerky motion and opening it at once. If the warm plate remains too long on the oilcloth, the gold leaf will stick. When the impression is done, the gold leaf is not swept off at once, but the oilcloth is first allowed to cool completely for several minutes, since there is a possibility that it has become slightly softened under the influence of the heat, especially at the borders of the pressed figures, and the gold would stick there if swept off immediately. The printing should be sharp and neat and the gold glossy. For bronze printing on oilcloth, a preliminary treatment of printing with varnish ground should be given. The bronze is dusted on this varnish.

Imitation leather is generally treated in the same manner. The tough paper substance is made to imitate leather perfectly as regards color and pressing, especially the various sorts of calf, but the treatment in press gilding differs entirely from that of genuine leather. The stuff does not possess the porous, spongy nature of leather, but on the contrary is very hard, and in the course of manufacture in stained-paper factories is given an almost waterproof coating of color and varnish. Hence the applied ground of white of egg penetrates but slightly into this substance, and a thin layer of white of egg remains on the surface. The consequence is that in gilding the gold leaf is prone to become attached, the ground of albumen being quickly dissolved under the action of the heat and put in a soft sticky state even in places where there is no engraving. In order to avoid this the ground is either printed only lukewarm, or this imitation leather is not primed at all, but the gold is applied immediately upon going over the surface with the oily rag. Print with a rather hot press, with about the same amount of heat as is employed for printing shagreen and title paper. A quick jerky printing, avoiding a long pressure of the plate, is necessary.

Liquid Gold.—Take an evaporating dish, put into it 880 parts, by weight, of pure gold; then 4,400 parts, by weight, of muriatic acid, and 3,520 parts, by weight, nitric acid; place over a gas flame until the gold is dissolved, and then add to it 22 parts, by weight, of pure tin; when the tin is dissolved add 42 parts, by weight, of butter of antimony. Let all remain over the gas until the mixture begins to thicken. Now put into a glass and test with the hydrometer, which should give about 1,800 specific gravity. Pour into a large glass and fill up with water until the hydrometer shows 1090; pour all the solution into a chemical pot and add to it 1,760 parts, by weight, balsam of sulphur, stirring well all the while, and put it over the gas again; in an hour it should give, on testing, 125° F.; gradually increase the heat up to 185° F., when it should be well stirred and then left to cool about 12 hours. Pour the watery fluid into a large vessel and wash the dark-looking mass 5 or 6 times with hot water; save each lot of water as it contains some portion of gold. Remove all moisture from the dark mass by rolling on a slab and warming before the fire occasionally so as to keep it soft. When quite dry add 2¼ times its weight of turpentine and put it over a small flame for about 2 hours; then slightly increase the heat for another hour and a half. Allow this to stand about 24 hours, and then take a glazed bowl and spread over the bottom of it 1,760 parts, by weight, of finely powdered bismuth; pour the prepared gold over it in several places. Now take a vessel containing water and place inside the other vessel containing the gold, and heat it so as to cause the water to boil for 3 hours; allow it to remain until settled and pour off the gold from the settlings of the bismuth, and try it; if not quite right continue the last process with bismuth until good; the bismuth causes the gold to adhere.

Preparation of Balsam of Sulphur.—Take 16 parts oil of turpentine; 2½ parts spirits of turpentine; 8 parts flour of sulphur.

Place all in a chemical pot and heat until it boils; continue the boiling until no sulphur can be seen in it; now remove from the heat and thin it with turpentine until about the thickness of treacle, then warm it again, stirring well; allow it to cool until it reaches 45° F., then test it with the hydrometer, and if specific gravity is not 995 continue the addition of turpentine and warming until correct, let it thoroughly cool, then bottle, keeping it air-tight.

To Purify Bismuth.—Take 6 parts bismuth metal, ¾ part saltpeter. Melt together in a biscuit cup, pour out on to a slab, and take away all dirt, then grind into a fine powder.

To Recover the Gold from the Remains of the Foregoing Process.—Put all the "watery" solutions into a large vessel and mix with a filtered saturated solution of copperas; this will cause

a precipitate of pure metallic gold to gradually subside; wash it with cold water and dry in an evaporating dish.

All rags and settlings that are thick should be burnt in a crucible until a yellow mass is seen; then take this and dissolve it in 2 parts muriatic acid and 1 part nitric acid. Let it remain in a porcelain dish until it begins to thicken, and crystals form on the sides. Add a little nitric acid, and heat until crystals again form. Now take this and mix with cold water, add a solution of copperas to it and allow it to settle; pour off the water, and with fresh water wash till quite free from acid. The gold may then be used again, and if great care is exercised almost one-half the original quantity may be recovered.

The quantities given in the recipe should produce about 13 to 15 parts of the liquid gold. It does not in use require any burnishing, and should be fired at rose-color heat. If desired it can be fluxed with Venice turpentine, oil of lavender, or almonds.

Treatment of Brittle Gold.—I.—Add to every 100 parts, by weight, 5 to 8 parts, by weight, of cupric chloride and melt until the oily layer which forms has disappeared. Then pour out, and in most cases a perfectly pliable gold will have been obtained. If this should not be the case after the first fusion, repeat the operation with the same quantity of cupric chloride. The cupric chloride must be kept in a well-closed bottle, made tight with paraffine, and in a dry place.

II.—Pass chlorine gas through the molten gold, by which treatment most of the gold which has otherwise been set aside as unfit for certain kinds of work may be redeemed.

Assaying of Gold.—To determine the presence of gold in ores, etc., mix a small quantity of the finely powdered ore in a flask with an equal volume of tincture of iodine, shake repeatedly and well, and leave in contact about 1 hour, with repeated shaking. Next allow the mixture to deposit and dip a narrow strip of filtering paper into the solution. Allow the paper to absorb, next to dry; then dip it again into the solution, repeating this 5 to 6 times, so that the filtering paper is well saturated and impregnated. The strip is now calcined, as it were, and the ashes, if gold is present, show a purple color. The coloring disappears immediately if the ashes are moistened with bromine water. The same test may also be modified as follows: Cover the finely pulverized ore with bromine water, shake well and repeatedly during about 1 hour of the contact, and filter. Now add to the solution stannic protochloride in solution, whereby, in case gold is present, a purple color (gold purple of Cassius) will at once appear. In case the ore to be assayed contains sulphides, it is well to roast the ore previously, and should it contain lime carbonate, it is advisable to calcine the ore before in the presence of ammonium carbonate.

Gold Welding.—Gold may be welded together with any metal, if the right methods are employed, but best with copper. Some recipes for welding agents are here given.

I.—Two parts by weight (16 ounces equal 1 pound) of green vitriol; 1 part by weight (16 ounces equal 1 pound) of saltpeter; 6 parts by weight (16 ounces equal 1 pound) of common salt; 1 part by weight (16 ounces equal 1 pound) of black manganic oxide or pulverized, and mixed with 48 parts by weight (16 ounces equal 1 pound) of good welding sand.

II.—Filings of the metal to be used in welding are mixed with melted borax in the usual proportion. To be applied in the thickness desired.

III.—A mixture of 338 parts of sodium phosphate and 124 parts of boracic acid is used when the metal is at dark-red heat. The metal is then to be brought to a bright-red heat, and hammered at the same time. The metal easily softens at a high temperature, and a wooden mallet is best. All substances containing carbon should be removed from the surface, as success depends upon the formation of a fusible copper phosphate, which dissolves a thin layer of oxide on the surface, and keeps the latter in good condition for welding.

To Recover Gold-Leaf Waste.—To recover the gold from color waste, gold brushes, rags, etc., they are burned up to ashes. The ashes are leached with boiling water containing hydrochloric acid. The auriferous residuum is then boiled with aqua regia (1 part nitric acid and 3 parts hydrochloric acid), whereby the gold is dissolved and gold chloride results. After filtration and evaporation to dryness the product is dissolved in water and precipitated with sulphate of protoxide of iron. The precipitated gold powder is purified with hydrochloric acid.

Gold from Acid Coloring Baths.—I.—Different lots are to be poured together

and the gold in them recovered. The following method is recommended: Dissolve a handful of phosphate of iron in boiling water, to which liquor add the coloring baths, whereby small particles of gold are precipitated. Then draw off the water, being careful not to dissolve the auriferous sediment at the bottom. Free this from all traces of acid by washing with plenty of boiling water; it will require 3 or 4 separate washings, with sufficient time between each to allow the water to cool and the sediment to settle before pouring off the water. Then dry in an iron vessel by the fire and fuse in a covered skittlepot with a flux.

II.—The collected old coloring baths are poured into a sufficiently large pot, an optional quantity of nitro-muriatic acid is added, and the pot is placed over the fire, during which time the fluid is stirred with a wooden stick. It is taken from the fire after a while, diluted largely with rain water and filtered through coarse paper. The gold is recovered from the filtered solution with a solution of green vitriol which is stored in air-tight bottles, then freshened with hot water, and finally smelted with borax and a little saltpeter.

Parting with Concentrated Sulphuric Acid.—It is not necessary scrupulously to observe the exact proportion of the gold to the silver. After having prepared the auriferous silver, place it in a quantity of concentrated sulphuric acid contained in a porcelain vessel, and let it come to a violent boil. When the acid has either become saturated and will dissolve no more, or when solution is complete, remove the dissolving vessel from the fire, let it cool, and, for the purpose of clarifying, pour dilute sulphuric acid into the solution. The dissolved silver is next carefully decanted from the gold sediment upon the bottom, another portion of concentrated acid is poured in, and the gold is well boiled again, as it will still contain traces of silver; this operation may be repeated as often as is deemed necessary. The solution, poured into the glass jars, is well diluted with water, and the silver is then precipitated by placing a sheet of copper in the solution. The precipitate is then freshened with hot water, which may also be done by washing upon the filter; the granulated silver (sulphate of silver) is pressed out in linen, dried and smelted. The freshened gold, after drying, is first smelted with bisulphate of soda, in order to convert the last traces of silver into sulphate, and then smelted with borax and a little saltpeter.

To Remove Gold from Silver.—I.—Gold is taken from the surface of silver by spreading over it a paste, made of powdered sal ammoniac with aqua fortis and heating it till the matter smokes and is nearly dry, when the gold may be separated by rubbing it with the scratch brush.

II.—The alloy is to be melted and poured from a height into a vessel of cold water, to which a rotary motion is imparted, or else it is to be poured through a broom. By this means the metal is reduced to a fine granular condition. The metallic substance is then treated with nitric acid, and gently heated. Nitrate of silver is produced, which can be reduced by any of the ordinary methods; while metallic gold remains as a black sediment, which must be washed and melted.

Simple Specific Gravity Test.—A certain quantity of the metal is taken and drawn out into a wire, which is to be exactly of the same length as one from fine silver; of course, both must have been drawn through the same hole, silver being nearly ½ lighter than gold, it is natural that the one of fine silver must be lighter, and the increased weight of the wire under test corresponds to the percentage of gold contained in it.

To Make Fat Oil Gold Size.—First thin up the fat oil with turpentine to workable condition; then mix a little very finely ground pigment with the gold size, about as much as in a thin priming coat. Make the size as nearly gold color as is convenient; chrome yellow tinted with vermilion is as good as anything for this purpose. Then thin ready for the brush with turpentine, and it will next be in order to run the size through a very fine strainer. Add japan, as experience or experiment may teach, to make it dry tacky about the time the leaf is to be laid. Dry slowly, because the slower the size dries, the longer it will hold its proper tackiness when it is once in that condition.

To Dissolve Copper from Gold Articles.—Take 2 ounces of proto-sulphate of iron and dissolve it in ½ a pint of water, then add to it in powder 2 ounces of nitrate of potash; boil the mixture for some time, and afterwards pour it into a shallow vessel to cool and crystallize; then to every part of the crystallized salt add 8 ounces of muriatic acid, and preserve in a bottle for use. Equal parts of the above preparation and of boiling water is a good proportion to use in dissolving copper, or 1 part by weight